

REMARKS

Claims 1-9 are pending in the present application.

Claims 1, 6 and 8-9 were amended solely to correct punctuation errors therein.

Reconsideration of the claims is respectfully requested.

35 U.S.C. § 102 (Anticipation)

Claims 1, 3-4, 6 and 9 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,226,349 to *Schuster et al.* This rejection is respectfully traversed.

A prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims. MPEP § 2131; *In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990). Anticipation is only shown where each and every limitation of the claimed invention is found in a single prior art reference. MPEP § 2131; *In re Donohue*, 766 F.2d 531, 534, 226 U.S.P.Q. 619, 621 (Fed. Cir. 1985).

Independent claims 1 and 6 each recite that the analyzer crystal and detector are rotatable about an axis that is coaxial with an axis about which a sample (or sample stage) may be rotated. In the present invention, the sample stage may be rotated to alter the angle of incidence of the collimated X-ray beam on the sample. Since the angle of diffraction also changes when the angle of incidence changes, the analyzer crystal and detector are rotated about the same axis as the sample stage to maintain the appropriate (relative) position and orientation. Such a feature is not described

in the cited reference. *Schuster et al* describes the glass substrate 8 as bearing the sample 9 “in a rotatable and height adjustable fashion” at the center of measurement circle 12. *Schuster et al*, column 8, lines 7–11. Thus, *Schuster et al* employs lateral translation as well as rotation to achieve the necessary relative position and orientation of Bragg reflector 5 and anode 3 when altering the angle of incidence of X-ray radiation 13. *Schuster et al* is silent as to rotating Bragg reflector 5 and anode 3.

Therefore, the rejection of claims 1, 3–4, 6 and 9 under 35 U.S.C. § 102 has been overcome.

35 U.S.C. § 103 (Obviousness)

Claims 2 and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Schuster et al* in view of B.D. Cullity, *Elements of X-Ray Diffraction* (Addison-Wesley Pub. Co., 2nd ed. 1978) (hereinafter “*Cullity*”). Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over *Schuster et al* in view of U.S. Patent No. 5,878,106 to *Fujiwara*. These rejections are respectfully traversed.

In *ex parte* examination of patent applications, the Patent Office bears the burden of establishing a *prima facie* case of obviousness. MPEP § 2142; *In re Fritch*, 972 F.2d 1260, 1262, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992). The initial burden of establishing a *prima facie* basis to deny patentability to a claimed invention is always upon the Patent Office. MPEP § 2142; *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 1472, 223 U.S.P.Q. 785, 788 (Fed. Cir. 1984). Only when a *prima facie* case of obviousness

is established does the burden shift to the applicant to produce evidence of nonobviousness. MPEP § 2142; *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Rijckaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). If the Patent Office does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of a patent. *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Grabiak*, 769 F.2d 729, 733, 226 U.S.P.Q. 870, 873 (Fed. Cir. 1985).

A *prima facie* case of obviousness is established when the teachings of the prior art itself suggest the claimed subject matter to a person of ordinary skill in the art. *In re Bell*, 991 F.2d 781, 783, 26 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1993). To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed invention and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. MPEP § 2142.

Claims 2 and 7 recite adjusting the size of a pinhole in the collimator, with claim 2 specifically reciting adjusting the size of the pinhole nearest the sample stage to produce an X-ray spot on the sample of variable size. Such a feature is not described by the cited references. As

conceded in the Office Action, *Schuster et al* does not described adjusting the size of a collimator pinhole. *Cullity* indicates that the maximum divergence β_2 of a pinhole collimator with a large source S is related to the size d of the pinhole nearest the crystal C. However, *Cullity* does not describe adjusting the pinhole in collimator, nor does *Cullity* contain a description of how a collimator might be fitted with an adjustable pinhole. At best, *Cullity* merely provides a suggestion to try to adjust a pinhole size.

Claim 5 recites rotating the sample stage and rotating the analyzer crystal and detector at a ratio of 1:2. Because a change in the angle of incidence causes a similar change in the angle of diffraction, when the sample stage is rotated by an angle α , the analyzer crystal and detector must be rotated by an angle 2α to account for both the change in the angle of incidence and the corresponding resulting change in the angle of diffraction. Such a feature is not described in the cited references. As noted above, *Schuster et al* is silent as to rotating the Bragg reflector 5 and anode 3, but instead describes combined rotation and height adjustment of the sample 9. The reference to an angle and twice the angle in Figure 8, relied upon in the Office Action, refers to a change in the angle of incidence producing twice as much change in the angle of diffraction at which the Bragg reflector 5 is oriented. However, *Schuster et al* does not described rotation the Bragg reflector 5 by that amount.

Therefore, the rejection of claims 2, 5 and 7 under 35 U.S.C. § 103 has been overcome.

AMENDMENTS WITH MARKINGS TO SHOW CHANGES MADE

The paragraphs on page 8 at lines 14–30 of the specification were amended herein as follows:

A sample stage 20 rotatable about an axis 21 for mounting a sample 22 is provided. The axis of rotation of the stage is arranged so that the axis passes through the front face 23 of the sample facing the X-ray source. An analyser crystal 30 is arranged on a detector [32]34. The analyser crystal and detector are both arranged on a detection stage 36 which is mounted to rotate the analyser and detector about an axis that is co-axial with the axis of rotation of the sample stage. The analyser crystal is a high-quality crystal with known diffraction properties that produces little background scattering.

The sample stage and detector stage are independently rotatable. In use, a sample 22 is mounted on the sample stage 20. X-rays 12 are collimated into a beam 24 by the double pinhole collimator and illuminate a small spot [38] on the sample. Scattered X-rays 26 are not collected. Diffracted X-rays 28 are incident on the analyser crystal 30 and diffracted by the analyser crystal 30 onto the detector 34. The detection stage 36 and the sample stage 20 are rotated and the intensity of X-rays reaching the detector is measured as a function of rotation angle.

Claims 1, 6 and 8-9 were amended herein as follows:

1. (amended) An X-ray diffractometer, comprising:

a sample stage for mounting a sample, the sample stage being rotatable about an axis[.];

a double pinhole collimator for directing X-ray radiation to a sample on the sample stage[.];

a detector for detecting X-rays diffracted by the sample[.]; and

an analyser crystal arranged between the sample stage and the detector to direct X-rays diffracted by the sample onto the detector,

wherein the analyser crystal and detector are rotatable about an axis that is coaxial with the axis of rotation of the sample stage.

6. (amended) A method of X-ray diffractometry, comprising the steps of:

directing X-rays through a double pinhole collimator onto a sample to be measured[.];

diffracting the X-rays diffracted by the sample with an analyser crystal onto a detector[.];

rotating the sample and rotating the analyser crystal and the detector about coaxial axes[.];

and

measuring the diffracted X-ray intensity as a function of the angle of rotation of the sample and the angle of rotation of the analyser crystal and detector.

1 8. (amended) A method of X-ray diffractometry according to claim 6 and further comprising the
2 steps of:

3 mounting the sample on a sample stage;

4 rotating the analyser crystal and detector to a predetermined position;

5 rotating the sample whilst keeping the analyser crystal and detector in the predetermined
6 position and measuring the X-rays reaching the detector as a function of angle of sample rotation;

7 determining the sample rotation angle at which the measure X-rays are at a peak and rotating
8 the sample to that angle; and

9 rotating the sample and the analyser crystal and detector about coaxial axes and measuring
10 the diffracted X-ray intensity as a function of rotation angle.

1 9. (amended) A method of X-ray diffractometry according to claim 6 and further comprising the
2 step of:

3 rotating the sample and the analyser crystal and detector with rotation speeds substantially
4 in a 1:2 ratio.

SUMMARY

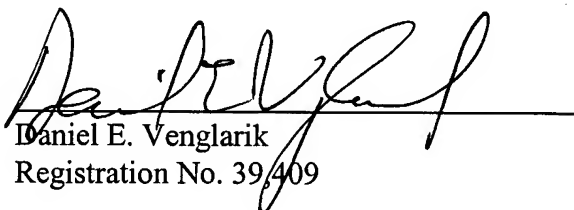
If any issues arise, or if the Examiner has any suggestions for expediting allowance of this Application, the Applicant respectfully invites the Examiner to contact the undersigned at the telephone number indicated below or at *dvenglarik@davismunck.com*.

The Commissioner is hereby authorized to charge any additional fees connected with this communication or credit any overpayment to Deposit Account No. 50-0208.

Respectfully submitted,

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